

**WHAT IS CLAIMED IS:**

1. A method of polishing metal and barrier layer interconnect integrated with an extremely low dielectric constant material, said method comprising the steps of:

- 5                   (a) preparing a wafer composed of a copper layer and the extremely low dielectric constant material, said copper layer being positioned over the low dielectric constant material, a barrier layer being positioned between said copper layer and said low dielectric constant material;
- 10                  (b) treating said copper layer chemically to produce a hard and brittle surface residue layer on the surface of said copper layer;
- (c) applying ultrasonic abrasion to said surface residue layer to cause the brittle fracturing of said surface residue layer, thereby rendering effective polishing of said wafer;
- 15                  (d) applying the ultrasonic abrasion to said barrier layer to render effective polishing of said wafer.

2. The method as defined in claim 1, wherein said surface residue layer in the step (b) is a cuprous compound.

- 20                 3. The method as defined in claim 2, wherein said cuprous compound is cuprous oxide.

- 25                 4. The method as defined in claim 1, wherein said ultrasonic abrasion is worked by that apply ultrasonic waves to a pad to enable said pad to move and to drive abrasive of abrasive slurry to abrade and polish said wafer.

5. The method as defined in claim 4, wherein said ultrasonic waves applied to said pad are transversal traveling or standing waves.

5 6. The method as defined in claim 1, wherein said ultrasonic abrasion is worked by that apply cavitation generated by scanning of the ultrasonic waves clustered by array-type structure to proceed to abrasion and polish.

10 7. The method as defined in claim 1, wherein said ultrasonic abrasion is worked by that apply the ultrasonic waves to a pad to enable said pad to drive abrasive slurry with abrasive to flow on the surface of said wafer, thereby generating and applying shearing force to abrade and polish the surface of said wafer.

15 8. The method as defined in claim 7, wherein said ultrasonic waves enable said abrasive slurry to generate hydrodynamic pressure via said pad for reducing the increasing relative velocity and the threshold pressure of the polishing process, and work as assistance to enhance the chemical treatment to render uniform effect.